

BEFORE
THE PUBLIC SERVICE COMMISSION
OF SOUTH CAROLINA

DOCKET NO. 2020-264-E
DOCKET NO. 2020-265-E

In the Matter of:)	
)	
Duke Energy Carolinas, LLC's)	DIRECT TESTIMONY
Establishment of Solar Choice)	OF R. THOMAS BEACH
Metering Tariffs Pursuant to S.C.)	ON BEHALF OF THE SOUTH
Code Ann. Section 58-40-20)	CAROLINA COASTAL
)	CONSERVATION LEAGUE,
Duke Energy Progress, LLC's)	SOUTHERN ALLIANCE FOR
Establishment of Solar Choice)	CLEAN ENERGY, UPSTATE
Metering Tariffs Pursuant to S.C.)	FOREVER, VOTE SOLAR, THE
Code Ann. Section 58-40-20)	SOLAR ENERGY INDUSTRIES
)	ASSOCIATION, AND THE NORTH
)	CAROLINA SUSTAINABLE
)	ENERGY ASSOCIATION
)	

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DIRECT TESTIMONY OF R. THOMAS BEACH

ON BEHALF OF

**THE SOUTH CAROLINA COASTAL CONSERVATION LEAGUE, SOUTHERN
ALLIANCE FOR CLEAN ENERGY, UPSTATE FOREVER, VOTE SOLAR, THE
SOLAR ENERGY INDUSTRIES ASSOCIATION, and THE NORTH CAROLINA
SUSTAINABLE ENERGY ASSOCIATION**

DOCKET NOS. 2020-264-E AND 2020-265-E

1 **I. Introduction and Qualifications**

2 **Q: PLEASE STATE FOR THE RECORD YOUR NAME, POSITION, AND**
3 **BUSINESS ADDRESS.**

4 A: My name is R. Thomas Beach. I am principal consultant of the consulting firm
5 Crossborder Energy. My business address is 2560 Ninth Street, Suite 213A,
6 Berkeley, California 94710.

7 **Q: PLEASE DESCRIBE YOUR EXPERIENCE AND QUALIFICATIONS.**

8 A: My experience and qualifications are described in the attached *curriculum vitae*
9 (CV), which is **Exhibit RTB-1** to this testimony. As reflected in my CV, I
10 have more than 35 years of experience on resource planning, rate design, and
11 ratemaking issues for natural gas and electric utilities. I began my career in
12 1981 on the staff at the California Public Utility Commission (“CPUC”),
13 working on the implementation of the Public Utilities Regulatory Policies Act,
14 on the restructuring of California’s natural gas industry, and as an advisor to
15 three commissioners. Since leaving the CPUC in 1989, I have had a private

1 consulting practice on energy issues and have appeared, testified, or submitted
2 comments, studies, or reports on numerous occasions before the state energy
3 regulatory commissions in many states. My CV includes a list of the formal
4 testimony that I have sponsored in state regulatory proceedings concerning
5 electric and gas utilities.

6 **Q: PLEASE DESCRIBE MORE SPECIFICALLY YOUR EXPERIENCE ON**
7 **AVOIDED COSTS AND ISSUES RELATED TO NET ENERGY**
8 **METERING AND THE COST-EFFECTIVENESS OF RENEWABLE**
9 **DISTRIBUTED GENERATION AND OTHER TYPES OF**
10 **DISTRIBUTED ENERGY RESOURCES.**

11 A: I have worked on issues concerning the calculation of avoided cost prices
12 throughout my career, including sponsoring testimony on avoided cost issues in
13 state regulatory proceedings in Oregon, California, Idaho, Montana, Nevada,
14 New Hampshire, North Carolina, and Vermont. With respect to benefit-cost
15 issues concerning renewable distributed generation (DG) and distributed energy
16 resources (DERs), I have sponsored testimony on net energy metering (NEM)
17 and solar economics in South Carolina and ten other states. Since 2013 I have
18 co-authored benefit-cost studies of NEM or solar DG in Arkansas, Arizona,
19 California, Colorado, New Hampshire, and North Carolina. I also co-authored
20 the chapter on Distributed Generation Policy in *America's Power Plan*, a report
21 on emerging energy issues, which was released in 2013 and is designed to
22 provide policymakers with tools (including rate design changes) to address key

1 questions concerning distributed generation resources.¹ Finally, since 2007, I
2 have sponsored testimony on rate design issues concerning solar DG and DERs
3 (such as electric vehicles and on-site storage) in general rate case proceedings
4 in Arizona, California, Massachusetts, New Jersey, and Texas.

5 **Q: HAVE YOU TESTIFIED BEFORE THIS COMMISSION?**

6 A: Yes. I appeared before this Commission in December 2014, sponsoring
7 testimony in Docket No. 2014-246-E recommending the methodology to use to
8 evaluate NEM in South Carolina, pursuant to Act 236, the predecessor to Act
9 62. I sponsored testimony on behalf of The Alliance for Solar Choice. This
10 proceeding resulted in Order No. 2015-194, which established the current NEM
11 program.

12 I also sponsored direct and rebuttal testimony in October 2020 in Docket No.
13 2019-182-E, the proceeding to determine the methodology to be used to
14 develop and assess the new Solar Choice tariffs to be implemented pursuant to
15 Act 62. In particular, my rebuttal testimony presented a complete evaluation of
16 Dominion Energy South Carolina's (Dominion or DESC) current NEM tariff
17 using the methodology I proposed to use for the Solar Choice program. Finally,
18 I recently provided testimony proposing a new Solar Choice tariff for DESC in
19 Docket No. 2020-229-E, including a full cost-effectiveness evaluation of that
20 proposal. I submitted the testimonies in Dockets Nos. 2019-182-E and 2020-
21 229-E on behalf of the same parties that I am representing in this testimony.

¹ This report has been published in *The Electricity Journal*, Volume 26, Issue 8 (October 2013). It is also available at <http://americaspowerplan.com/>.

1 **Q: ON WHOSE BEHALF ARE YOU TESTIFYING IN THIS**
2 **PROCEEDING?**

3 A: I am testifying on behalf of South Carolina Coastal Conservation League,
4 Upstate Forever, Southern Alliance for Clean Energy, Vote Solar, the Solar
5 Energy Industries Association, and the North Carolina Sustainable Energy
6 Association.

7 **II. Summary of Testimony**

8 **Q: PLEASE SUMMARIZE YOUR TESTIMONY.**

9 A: My testimony discusses why I support the proposal of the Duke utilities
10 concerning a new residential Solar Choice tariff for DEC and DEP, consistent
11 with Act 62. The DEC/DEP proposal was developed through extensive
12 discussions and negotiations involving the Duke utilities and a group of key
13 stakeholders. The key features of Duke's new Solar Choice tariff are:

- 14 • A time-of-use (TOU) rate with significant rate differences between the
15 TOU periods;
- 16 • An overlay of high critical peak pricing (CPP) rates applicable to the
17 on-peak hours on a limited number of high-demand days that the
18 utilities can call a day in advance;
- 19 • Monthly netting of imported and exported power within TOU periods;
- 20 • Net exports credited at a wholesale avoided cost rate; and
- 21 • A monthly minimum bill of \$30 per month.

22 Act 62 requires a balancing of the often-competing interests of both the
23 participating ratepayers who install solar and the non-participating customers

1 who do not. The DEC/DEP Solar Choice tariffs achieve this balance by both
2 maintaining distributed solar as a reasonable economic option for residential
3 customers, yet eliminating to the greatest extent practicable any cost shift
4 associated with customer adoption of this resource. This testimony concludes
5 that the cost-effectiveness analyses submitted by the Duke utilities are a
6 reasonable, even conservative, showing that the tariffs eliminate any cost shift
7 concerns. Thus, overall, the DEC/DEP tariffs comply with Act 62's goal of
8 maintaining a "reasonable opportunity" for customers to invest in expanding
9 South Carolina's clean energy infrastructure – an opportunity that is reasonable
10 for both participating and non-participating ratepayers.

11 This testimony also comments on the important rate design elements of the
12 proposed Solar Choice tariffs. The TOU rate structure aligns more closely to
13 the utilities' time-varying cost of service, and the overlay of CPP rates sends
14 the strongest price signals to customers in the peak hours on a limited number
15 of days when demand is expected to be very high. These CPP event days are
16 exactly when reductions in usage are most valuable to the system. The
17 proposed DEC/DEP tariffs include elements that strongly encourage customers
18 to limit the sizes of their solar systems, and thus to limit any residual cost shift
19 that might occur. These elements include the \$30 per month minimum bill, the
20 compensation for monthly net exports at a low wholesale avoided cost rate, and
21 the grid access fee for systems larger than 15 kW. The monthly minimum bill
22 also ensures recovery from solar customers of the utilities' customer-related
23 costs that do not vary with usage.

1 Finally, the proposed DEC/DEP Solar Choice tariffs represent a reasonable first
2 step toward a rate platform that can support deployment of other types of
3 DERs. Rooftop solar is just one type of DER, which also include storage, smart
4 thermostats, electric vehicles (EVs), and programmable heat pumps for space
5 and water heating. These other types of DERs promise to provide system
6 benefits both by increasing loads (as do EVs and electric heat pumps that
7 displace gas appliances) and by shifting loads out of peak periods (as do storage
8 and smart thermostats). In the future, customers increasingly will adopt solar in
9 conjunction with other DER technologies. As a result, the rate structure
10 applicable to solar customers also must be adaptable to other DER
11 technologies.

12 **III. DEC's and DEP's Proposed Solar Choice Tariff**

13 **Q: PLEASE SUMMARIZE DEC/DEP'S SOLAR CHOICE PROPOSAL.**

14 A: The DEC/DEP Solar Choice tariff proposal includes both interim and
15 permanent Solar Choice riders. I will begin with the permanent riders.
16 The Companies' permanent Solar Choice riders (the "Permanent Riders") have
17 the following key features:

- 18 • Available to residential customers who apply for interconnection on or after
19 January 1, 2022;
- 20 • A solar Time of Use ("TOU") rate schedule, shown in **Table 1** below, that
21 includes TOU volumetric rates with a monthly grid access fee ("GAF") for
22 systems larger than 15 kilowatts ("kW") and non-bypassable charges;

- 1 • An overlay of critical peak pricing (“CPP”) rates that apply on a limited number
- 2 of on-peak hours called in advance;
- 3 • Monthly netting of imported and exported power within TOU periods;
- 4 • Net exports credited at avoided cost; and
- 5 • A monthly minimum bill of \$30 per month.

6 **Table 1: Permanent Solar Choice Riders – TOU Rates**

Prices including fuel clause, without Riders (c/kWh)		
	DEC SC	DEP SC
Peak	15.1760	15.843
Off-Peak	8.7586	9.529
Super-Off-Peak	6.0268	6.994
Critical Peak*	25	25

7 * Price for peak hours on up to 20 Company-designated Critical Price days per year

8 The annual on-peak period would be from 6:00 pm to 9:00 pm, with an

9 additional winter on-peak period during the months of December through

10 February from 6:00 am to 9:00 am. The super off-peak period will take place

11 during the months of March through November during the hours of 12:00 am to

12 6:00 am.

13 DEC and DEP also will offer Interim Riders as a bridge from the current NEM

14 program to the permanent Solar Choice tariff. The Interim Riders will be

15 available for residential customers who apply for interconnection from June 1,

16 2021 through December 31, 2021. Residential customers will receive service

17 under their existing rate schedule and an Interim Rider. The Interim Riders will

18 be similar to the currently approved NEM rider but will include monthly netting

19 with net exports credited at wholesale avoided cost; non-bypassable charges for

1 costs such as energy efficiency costs, cyber security costs, storm cost recovery
2 and similar costs; enrollment caps; and future service provisions.

3 **Q: PLEASE DESCRIBE THE PROCESS THROUGH WHICH THE DUKE**
4 **UTILITIES DEVELOPED THIS PROPOSAL.**

5 A: The DEC/DEP Solar Choice proposal is the product of extensive dialogue and
6 negotiation between the utilities and important stakeholders – including key
7 representatives of the solar industry as well as clean energy advocates – as
8 discussed in more detail in the testimony of Duke witness Leigh Ford. The
9 Stipulation that these parties reached is included in the record. The
10 development of a complex new net metering program through constructive
11 discussions, negotiation, and compromise is a welcome development given that
12 similar issues in other states have resulted in protracted litigation and public
13 controversy. For example, in late 2015, the Public Utilities Commission of
14 Nevada (PUCN) adopted, without change, a cost-of-service study from the
15 utility NV Energy that showed a significant cost shift from non-participating
16 ratepayers to solar DG customers. As a result, the PUCN ended NEM in
17 Nevada, increased the fixed monthly customer charge for DG customers, and
18 reduced the export rate credited to DG systems from the full retail rate (about
19 11 cents/kWh for residential customers) to an energy-only avoided cost rate of
20 2.6 cents/kWh. The PUCN took this action even though its order found that
21 there were eleven components to the value of DG, but only quantified two of

1 those components.² The reduction in the export rate and the increased fixed
 2 charge reduced the bill savings available to NEM customers in Nevada by at
 3 least 40%. Such a precipitate reduction decimated the market for new solar DG
 4 systems in the state, and resulted in more than 1,000 documented layoffs at
 5 solar companies.³ After a year of significant public outcry and political
 6 turmoil, the PUCN (with several new commissioners) reversed course, re-
 7 evaluated the benefits and costs of solar DG, and subsequently adopted a
 8 reopening of net metering in Nevada with a much more gradual change in the
 9 compensation to solar customers.⁴

10 I agree with the testimony of Duke witness Lon Huber that the proposed
 11 DEC/DEP Solar Choice tariffs represent a complicated mix of inter-related
 12 concessions and compromises among the involved stakeholders.⁵ Stakeholders
 13 who negotiated the Stipulation will have different opinions about individual
 14 elements, but there was agreement among these diverse parties that, as a
 15 package, the deal is a reasonable and constructive compromise.

16 **IV. The DEC/DEP Solar Choice Tariffs Achieve the Balance that Act 62**
 17 **Requires**

² See PUCN Order in Dockets Nos. 15-07-041 and 15-07-042 issued December 23, 2015, at pp. 66-67 and 95-96.

³ See Prepared Direct and Rebuttal Testimonies of R. Thomas Beach on behalf of TASC, served February 1 and 5, 2016 in PUCN Dockets Nos. 15-07-041 and 15-07-042.

⁴ See PUCN, *Order Granting in Part and Denying in Part Joint Application of NV Energy on Assembly Bill 405*, issued September 1, 2017 in Docket No. 17-07026, at p. 2.

⁵ See *Direct Testimony of Lon Huber for DEC/DEP*, at p. 19.

1 **Q: HOW DOES THE AGREEMENT REACHED IN DEVELOPING THE**
 2 **DEC/DEP SOLAR CHOICE TARIFFS RESPOND TO THE**
 3 **REQUIREMENTS OF ACT 62?**

4 A: Key provisions of Act 62 require a balancing of the often-competing interests
 5 of both **participants** (ratepayers who install DERs) and **non-participants**
 6 (customers who do not adopt DERs and who will pay rates that may include
 7 costs associated with DER adoption). With respect to participants, the law
 8 provides:
 9 Every customer of an electrical utility has the right to a rate schedule that offers
 10 the customer a reasonable opportunity to employ such energy and cost-saving
 11 measures as energy efficiency, demand response, or onsite distributed energy
 12 resources in order to reduce consumption of electricity from the electrical
 13 utility's grid and to reduce electrical utility costs.⁶
 14 Further, the act requires that new Solar Choice tariffs should "permit solar
 15 choice customer-generators to use customer-generated energy behind the meter
 16 without penalty."⁷ On the other hand, the statute addresses the interests of non-
 17 participating ratepayers, by setting a goal of eliminating "to the greatest extent
 18 practicable" any cost shift resulting from the new tariff.⁸
 19 Thus, new Solar Choice tariffs should balance the interests of all ratepayers
 20 (participants and non-participants) and the state of South Carolina as a whole
 21 (including consideration of the economic impacts on the state from the net

⁶ See Section 58-27-845(A) - (D).

⁷ See Section 58-40-20(G).

⁸ *Ibid.*

1 metering program). Any new charge or rate design applicable to net-metered
2 customers should be tested to ensure that, after it is applied, renewable DG will
3 remain a viable economic proposition for participating ratepayers while not
4 imposing undue upward pressure on the rates of non-participants. This is the
5 balance specified in Section 58-40-20(D) of Act 62.

6 **Q: HOW DO THE DEC/DEP SOLAR CHOICE TARIFFS ADDRESS THE**
7 **NEEDS OF PARTICIPATING CUSTOMERS?**

8 A: Customers who invest in clean distributed solar generation need to see adequate
9 bill savings to make their investment a reasonable economic proposition. The
10 DEC/DEP tariffs will result in a moderate reduction in the bill savings available
11 to solar customers when compared with current NEM tariffs, on the order of a
12 10% decrease for a typical customer. Because the costs of residential solar in
13 South Carolina are similar to the available bill savings, a reduction in bill
14 savings larger than this could have a serious negative impact on the residential
15 solar market. Further, the reduction in bill savings is greater for larger
16 residential customers; this may help customers with smaller homes and lower
17 electric usage (and presumably lower incomes) to be able to afford to invest in
18 solar or adopt solar through a leasing arrangement.

19 In addition, under the proposed DEC/DEP tariff, participating customers will
20 gain new opportunities to reduce their costs if they take actions that also will
21 benefit the grid and reduce costs for non-participants. These opportunities may
22 help to offset some of the reduction in bill savings. For example, the TOU rate
23 structure will send a strong price signal to customers to use appliances and

1 otherwise manage their home energy use to shift loads out of the on-peak
2 periods and into off-peak and super-off-peak hours. The CPP overlay will send
3 the strongest TOU price signals during those peak demand hours when the grid
4 is most stressed; this feature will help to target customers' demand reductions
5 to the high-demand days when they are most needed by the system. Finally, as
6 discussed further below, the structure of the new rate promises to provide a
7 platform for use with other types of distributed energy resources, including
8 smart thermostats, storage, and electric vehicles (EVs).

9 Overall, in my judgement, the DEC/DEP Solar Choice tariffs will comply with
10 Act 62 by maintaining a "reasonable opportunity" for customers to invest in
11 expanding South Carolina's clean energy infrastructure.

12 **Q: FOR NON-PARTICIPANTS, DO THE PROPOSED TARIFFS REDUCE**
13 **ANY COST SHIFT AS MUCH AS PRACTICABLE?**

14 A: Yes, I believe that they do. I have reviewed and concur with the testimony of
15 Duke witness Bradley Harris, which reviewed the proposed tariffs using both
16 embedded and marginal cost analyses. The embedded cost analyses using
17 Duke's current cost-of-service studies show that the reduction in solar
18 customers' cost of service more than offsets the revenue lost. The marginal
19 cost analyses show a substantial, but not complete, reduction in the cost shift.⁹
20 However, I view Mr. Harris's marginal cost analyses as conservative, as I
21 would include in the marginal costs analyses additional quantifiable benefits
22 specified in Act 62 that his analysis does not consider. For example, my recent

⁹ See *Direct Testimony of Bradley Harris for DEC/DEP*, at pp. 5-7.

1 testimony in Docket No. 2019-182-E quantified several of the benefits of
 2 renewable DG that both Act 62 and Act 236 have specified should be
 3 considered, but that the utilities have not quantified. These include avoided
 4 costs for carbon emissions and fuel hedging benefits, which combined could
 5 add approximately \$0.045 per kWh to the benefits.¹⁰ My calculations of
 6 avoided generation capacity and transmission & distribution costs also appear
 7 to be higher than those used by the utilities.¹¹ Considering these additional
 8 benefits, the marginal cost analysis should show benefits from the tariffs that
 9 more closely approach or exceed the costs. Finally, the TOU/CPP rate structure
 10 will encourage solar customers to shift usage out of the on-peak TOU periods.¹²
 11 The additional benefits of these load shifts are not included in the DEC/DEP
 12 analyses of the proposed Solar Choice tariffs.
 13 Even if one concludes that the DCE/DEP Solar Choice tariffs would result in a
 14 small cost shift, the structure of the new Solar Choice tariffs has a number of
 15 elements that will limit any such remaining cost shift. The proposed DEC/DEP
 16 tariffs include elements that strongly encourage customers to limit the sizes of
 17 their solar systems, and thus to limit any residual cost shift. The \$30 per month
 18 minimum bill and the compensation for monthly net exports at a low wholesale

¹⁰ See *Rebuttal Testimony of R. Thomas Beach for the South Carolina Coastal Conservation League, Southern Alliance for Clean Energy, Upstate Forever, Vote Solar, the Solar Energy Industries Association, and the North Carolina Sustainable Energy Association* in Docket No. 2019-182-E (October 29, 2020), at pp. 13-16.

¹¹ *Ibid.*, at pp. 6-8 and 10-13.

¹² Ahmad Faruqui and others at the Brattle Group have assembled a database of the peak reductions produced by different types of time-varying rate design. CPP rates have reduced peak demands by 10% to 50%. See Ahmad Faruqui, *The Transformative Power of Time-Varying Rates* (March 8, 2019), at Figure 1, available at <https://energycentral.com/c/em/transformative-power-time-varying-rates>.

1 avoided cost rate will sharply reduce bill savings as the size of the customer's
2 solar system approaches the customer's annual usage. The grid access fee for
3 systems larger than 15 kW will recover additional revenue from the largest
4 residential customers who may have the roof space or available land to install
5 very large systems.

6 Further, Act 62 requires a reduction in any cost shift "to the greatest extent
7 practicable." This means that the cost shift does not have to be eliminated, but
8 should be reduced as much as reasonably feasible (i.e. "practicable") while still
9 meeting the other goals of Act 62. Those other goals include providing
10 participating customers with, as Act 62 requires, a "reasonable opportunity" to
11 invest in distributed solar.

12 **V. A Platform for Future DER Adoption**

13 **Q: PLEASE COMMENT WHETHER THE DUKE UTILITIES' SOLAR**
14 **CHOICE PROPOSAL IS A LOGICAL STEP AWAY FROM THE**
15 **CURRENT NEM PROGRAM.**

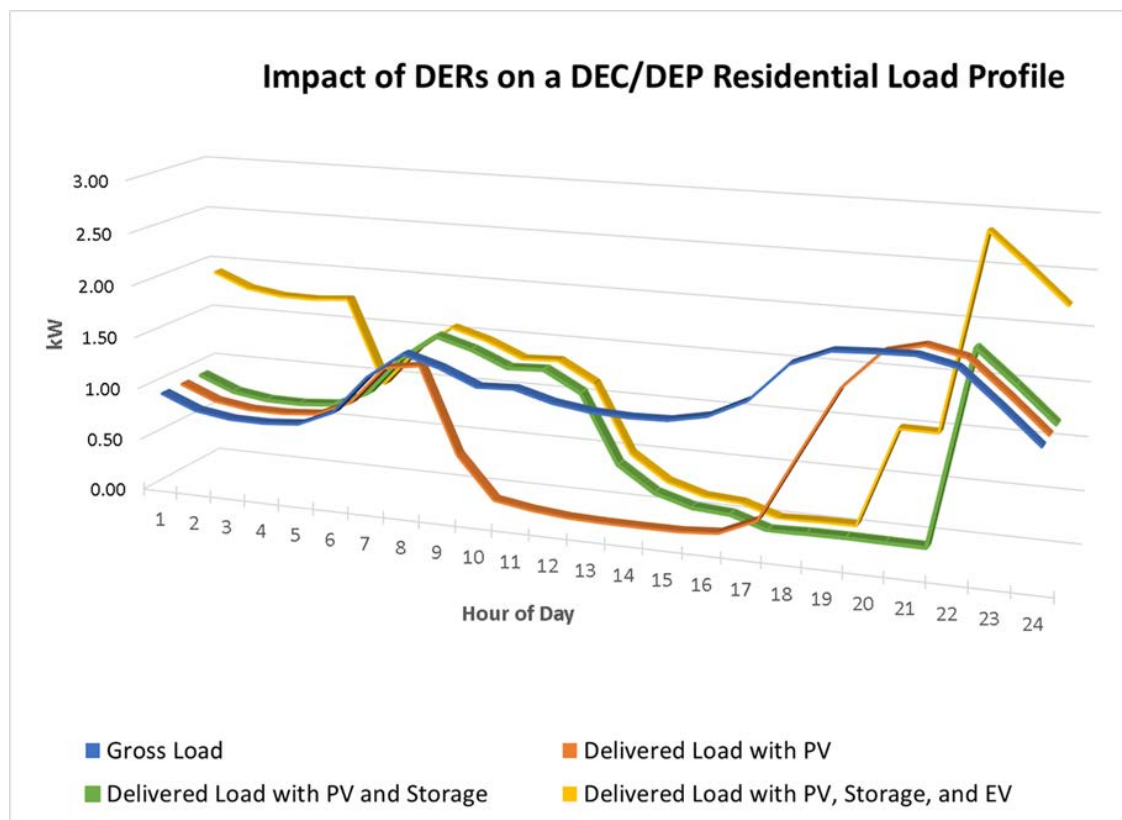
16 **A:** The DEC/DEP Solar Choice tariffs focus on a new rate and compensation
17 structure for customers who install solar. Nonetheless, the tariffs are a
18 reasonable first step toward tariffs that should be applicable to customers who
19 install other types of DERs as well. This is important because rooftop solar
20 systems are just one type of distributed energy resource. DERs also include
21 storage, smart thermostats, electric vehicles (EVs), and programmable heat
22 pumps for space and water heating. The solar industry recognizes that

1 customers increasingly will adopt solar in conjunction with these other DER
2 technologies.

3 Solar is a DER that produces on-site power over the daylight hours, reducing
4 the loads that the solar customer takes from the grid, and exporting excess
5 generation to serve neighboring loads. Other DERs such as storage, smart
6 thermostats, and programmable appliances also allow the loads served from the
7 grid to be reduced and/or shifted in time. EVs and heat pumps are DERs that
8 build new loads, with customers enabled and encouraged to use those
9 technologies at times that do not stress the grid. In the coming future,
10 customers will be able to use combinations of all of these DERs in ways that
11 will have significant impacts on the time profile of their energy use. As an
12 example, **Figure 1** below shows four distinct residential load profiles that
13 illustrate how a single DEC/DEP residential customer's load profile for
14 delivered energy can change as the customer adopts three different DER
15 technologies in succession. The four profiles are:

- 16 1. **Blue:** Residential customer using 11,500 kWh per year with no DERs.
- 17 2. **Orange:** the customer adds solar with output equal to 75% of the annual load.
- 18 3. **Green:** customer adds 11 kWh of battery storage; the storage is charged during
19 the solar production hours, and discharged in the 6 p.m. to 9 p.m. peak period.
- 20 4. **Yellow:** the customer adds an EV using 3,500 kWh per year. The EV is
21 charged between 7 p.m. and 5 a.m.

22 **Figure 1**



As DERs proliferate, TOU rates will become an essential platform to unlock the benefits of these new technologies. The availability of sophisticated metering for all sizes of customers is enabling TOU pricing for all customer classes, including residential customers. Many utility costs vary significantly by the time of day. As a result, time-of-use (TOU) rates are more accurate and align more closely with the utility's cost-of-service.¹³ The CPP overlay in the Duke utilities' Solar Choice rate design makes the TOU rates even more accurate, by charging the highest rate during the peak hours of a limited number of high-demand days that are the most critical to reliability. These are the peak hours that drive capacity-related costs.

¹³ I agree with the testimony of DEC/DEP witness Lon Huber in this regard, at page 12 of his testimony: "TOU-based rates more closely align to system costs and send better price signals to customers than traditional two-part rates."

1 Thus, the use of TOU rates by customers who adopt solar and other types of
2 DERs is important in order to realize the full benefits of these new
3 technologies, to increase the accuracy of pricing the services that utilities
4 provide from the grid, and to minimize the potential for DERs to shift costs to
5 other customers. Several sections of Act 62 direct the Commission to
6 encourage the use of more accurate, time-varying rates by DER customers.¹⁴
7 States with high penetrations of DERs – Hawaii, California, and Arizona, for
8 example – have strongly encouraged or required DER customers to use TOU
9 rates.¹⁵ DERs have proven to be an important tool that encourages customers to
10 learn about and to adopt TOU rates, and then to invest not just in solar, but in a
11 range of new DER technologies that change the profile of their energy use from
12 the grid in ways that benefit all ratepayers and the system as a whole.
13 Finally, as an initial example of the use of the Solar Choice tariffs as a platform
14 for other DERs, the tariffs have been designed to work with a winter smart
15 thermostat program that DEC and DEP are proposing in other dockets.¹⁶ Such
16 programs will be important to enable Solar Choice customers to manage the
17 load that they place on the grid during high-priced CPP event days.

18 **Q: PLEASE COMMENT ON THE USE OF THE \$30 MINIMUM BILL IN**
19 **THE DEC/DEP TARIFFS.**

¹⁴ See the provision in Section 58-40-20(D)(2) requiring the Commission to consider the “cost of service implications” of DER customers. Section 58-27-845(D) also underlines the importance of providing customers with time-varying rates.

¹⁵ See, for example, California Public Utilities Commission Decision No. 16-01-044 adopting revisions to NEM in California, including a requirement to use TOU rates.

¹⁶ See *Direct Testimony of Leigh C. Ford for DEC/DEP*, at Exhibit 3 (September 21, 2020 update to the Commission in Docket Nos. 2019-169-E and 2019-170-E).

1 A: The minimum bill used in the DEC/DEP proposal is a rate design element for
 2 residential customers that is preferable to fixed or demand charges. A
 3 minimum bill ensures that all customers make at least a certain monthly
 4 contribution to the utility infrastructure that serves them. In this case, the \$30
 5 minimum bill covers the utilities' customer-related costs for metering, billing,
 6 and customer account services, as well as certain distribution costs. As noted
 7 by Duke witness Mr. Huber, "The MMB [monthly minimum bill] will ensure
 8 that the minimum costs to serve a customer will be paid by that customer,
 9 regardless of their usage."¹⁷ This is consistent with cost causation so long as
 10 the minimum bill is limited to the utility's costs that are independent of usage
 11 and which are incurred solely as a result of the customer's connection to the
 12 utility's distribution grid.¹⁸ As noted above, the minimum bill, plus the
 13 compensation for monthly net exports at a low avoided cost rate, will limit the
 14 size of solar systems to what the customer expects to consume. A minimum
 15 bill is superior to a fixed charge because it allows a greater scope for customers
 16 to impact their energy bill. It is also preferable to a residential demand charge,
 17 which may not accurately reflect cost-causation, is difficult for residential
 18 customers to understand, and is nearly impossible for them to manage. In
 19 essence, minimum bills strike a fairer balance between allowing customer
 20 choice and ensuring that all customers make an equitable contribution to the
 21 costs of utility infrastructure.

¹⁷ See *Direct Testimony of Lon Huber for DEC/DEP*, at p.15.

¹⁸ As with all the elements of the DEC/DEP tariffs, the minimum bill was the subject of negotiation, and stakeholders had different views on the extent and magnitude of the utilities' costs that are caused and should be collected regardless of a customer's usage.

1 **Q: DOES THIS CONCLUDE YOUR TESTIMONY?**

2 A: Yes, it does.

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OF SOUTH CAROLINA

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Duke Energy Carolinas, LLC's)	
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Metering Tariffs Pursuant to S.C.)	CERTIFICATE OF SERVICE
Code Ann. Section 58-40-20)	
)	
Duke Energy Progress, LLC's)	
Establishment of Solar Choice)	
Metering Tariffs Pursuant to S.C.)	
Code Ann. Section 58-40-20)	
)	

I certify that the following persons have been served with one (1) copy of Testimony of R, Thomas Beach on behalf of the South Carolina Coastal Conservation League, Southern Alliance for Clean Energy, Upstate Forever, Vote Solar, the Solar Energy Industries Association, and the North Carolina Sustainable Energy Association by electronic mail and/or U.S. First Class Mail at the addresses set forth below:

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/s/ Rachel Pruzin
February 8, 2021

R. THOMAS BEACH
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Mr. Beach is principal consultant with the consulting firm Crossborder Energy. Crossborder Energy provides economic consulting services and strategic advice on market and regulatory issues concerning the natural gas and electric industries. The firm is based in Berkeley, California, and its practice focuses on the energy markets in California, the U.S., and Canada.

Since 1989, Mr. Beach has had an active consulting practice on policy, economic, and ratemaking issues concerning renewable energy development, the restructuring of the gas and electric industries, the addition of new natural gas pipeline and storage capacity, and a wide range of issues concerning independent power generation. From 1981 through 1989 he served at the California Public Utilities Commission, including five years as an advisor to three CPUC commissioners. While at the CPUC, he was a key advisor on the CPUC's restructuring of the natural gas industry in California, and worked extensively on the state's implementation of the Public Utilities Regulatory Policies Act of 1978.

AREAS OF EXPERTISE

- *Renewable Energy Issues:* extensive experience assisting clients with issues concerning Renewable Portfolio Standard programs, including program structure and rate impacts. He has also worked for the solar industry on rate design and net energy metering issues, on the creation of the California Solar Initiative, as well as on a wide range of solar issues in many other states.
- *Restructuring the Natural Gas and Electric Industries:* consulting and expert testimony on numerous issues involving the restructuring of the electric industry, including the 2000 - 2001 Western energy crisis.
- *Energy Markets:* studies and consultation on the dynamics of natural gas and electric markets, including the impacts of new pipeline capacity on natural gas prices and of electric restructuring on wholesale electric prices.
- *Qualifying Facility Issues:* consulting with QF clients on a broad range of issues involving independent power facilities in the Western U.S. He is one of the leading experts in California on the calculation of avoided cost prices. Other QF issues on which he has worked include complex QF contract restructurings, standby rates, greenhouse gas emission regulations, and natural gas rates for cogenerators. Crossborder Energy's QF clients include the full range of QF technologies, both fossil-fueled and renewable.
- *Pricing Policy in Regulated Industries:* consulting and expert testimony on natural gas pipeline rates and on marginal cost-based rates for natural gas and electric utilities.

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EDUCATION

Mr. Beach holds a B.A. in English and physics from Dartmouth College, and an M.E. in mechanical engineering from the University of California at Berkeley.

ACADEMIC HONORS

Graduated from Dartmouth with high honors in physics and honors in English.
 Chevron Fellowship, U.C. Berkeley, 1978-79

PROFESSIONAL ACCREDITATION

Registered professional engineer in the state of California.

EXPERT WITNESS TESTIMONY BEFORE THE CALIFORNIA PUBLIC UTILITIES COMMISSION

1. Prepared Direct Testimony on Behalf of **Pacific Gas & Electric Company/Pacific Gas Transmission** (I. 88-12-027 — July 15, 1989)
 - *Competitive and environmental benefits of new natural gas pipeline capacity to California.*
2.
 - a. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (A. 89-08-024 — November 10, 1989)
 - b. Prepared Rebuttal Testimony on Behalf of the **Canadian Producer Group** (A. 89-08-024 — November 30, 1989)
 - *Natural gas procurement policy; gas cost forecasting.*
3. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (R. 88-08-018 — December 7, 1989)
 - *Brokering of interstate pipeline capacity.*
4. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (A. 90-08-029 — November 1, 1990)
 - *Natural gas procurement policy; gas cost forecasting; brokerage fees.*
5. Prepared Direct Testimony on Behalf of the **Alberta Petroleum Marketing Commission and the Canadian Producer Group** (I. 86-06-005 — December 21, 1990)
 - *Firm and interruptible rates for noncore natural gas users*

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6.
 - a. Prepared Direct Testimony on Behalf of the **Alberta Petroleum Marketing Commission** (R. 88-08-018 — January 25, 1991)
 - b. Prepared Responsive Testimony on Behalf of the **Alberta Petroleum Marketing Commission** (R. 88-08-018 — March 29, 1991)
 - *Brokering of interstate pipeline capacity; intrastate transportation policies.*
7. Prepared Direct Testimony on Behalf of the **Canadian Producer Group** (A. 90-08-029/Phase II — April 17, 1991)
 - *Natural gas brokerage and transport fees.*
8. Prepared Direct Testimony on Behalf of **LUZ Partnership Management** (A. 91-01-027 — July 15, 1991)
 - *Natural gas parity rates for cogenerators and solar thermal power plants.*
9. Prepared Joint Testimony of R. Thomas Beach and Dr. Robert B. Weisenmiller on Behalf of the **California Cogeneration Council** (I. 89-07-004 — July 15, 1991)
 - *Avoided cost pricing; use of published natural gas price indices to set avoided cost prices for qualifying facilities.*
10.
 - a. Prepared Direct Testimony on Behalf of the **Indicated Expansion Shippers** (A. 89-04-033 — October 28, 1991)
 - b. Prepared Rebuttal Testimony on Behalf of the **Indicated Expansion Shippers** (A. 89-04-0033 — November 26, 1991)
 - *Natural gas pipeline rate design; cost/benefit analysis of rolled-in rates.*
11. Prepared Direct Testimony on Behalf of the **Independent Petroleum Association of Canada** (A. 91-04-003 — January 17, 1992)
 - *Natural gas procurement policy; prudence of past gas purchases.*
12.
 - a. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (I.86-06-005/Phase II — June 18, 1992)
 - b. Prepared Rebuttal Testimony on Behalf of the **California Cogeneration Council** (I. 86-06-005/Phase II — July 2, 1992)
 - *Long-Run Marginal Cost (LRMC) rate design for natural gas utilities.*
13. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (A. 92-10-017 — February 19, 1993)
 - *Performance-based ratemaking for electric utilities.*

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14. Prepared Direct Testimony on Behalf of the **SEGS Projects** (C. 93-02-014/A. 93-03-053 — May 21, 1993)
 - *Natural gas transportation service for wholesale customers.*
15. a. Prepared Direct Testimony on Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038 — June 28, 1993)
 b. Prepared Rebuttal Testimony of Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038 — July 8, 1993)
 - *Natural gas pipeline rate design issues.*
16. a. Prepared Direct Testimony on Behalf of the **SEGS Projects** (C. 93-05-023 — November 10, 1993)
 b. Prepared Rebuttal Testimony on Behalf of the **SEGS Projects** (C. 93-05-023 — January 10, 1994)
 - *Utility overcharges for natural gas service; cogeneration parity issues.*
17. Prepared Direct Testimony on Behalf of the **City of Vernon** (A. 93-09-006/A. 93-08-022/A. 93-09-048 — June 17, 1994)
 - *Natural gas rate design for wholesale customers; retail competition issues.*
18. Prepared Direct Testimony of R. Thomas Beach on Behalf of the **SEGS Projects** (A. 94-01-021 — August 5, 1994)
 - *Natural gas rate design issues; rate parity for solar thermal power plants.*
19. Prepared Direct Testimony on Transition Cost Issues on Behalf of **Watson Cogeneration Company** (R. 94-04-031/I. 94-04-032 — December 5, 1994)
 - *Policy issues concerning the calculation, allocation, and recovery of transition costs associated with electric industry restructuring.*
20. Prepared Direct Testimony on Nuclear Cost Recovery Issues on Behalf of the **California Cogeneration Council** (A. 93-12-025/I. 94-02-002 — February 14, 1995)
 - *Recovery of above-market nuclear plant costs under electric restructuring.*
21. Prepared Direct Testimony on Behalf of the **Sacramento Municipal Utility District** (A. 94-11-015 — June 16, 1995)
 - *Natural gas rate design; unbundled mainline transportation rates.*

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22. Prepared Direct Testimony on Behalf of **Watson Cogeneration Company** (A. 95-05-049 — September 11, 1995)
 - *Incremental Energy Rates; air quality compliance costs.*
23. a. Prepared Direct Testimony on Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038/A. 94-05-035/A. 94-06-034/A. 94-09-056/A. 94-06-044 — January 30, 1996)
 - b. Prepared Rebuttal Testimony on Behalf of the **Canadian Association of Petroleum Producers** (A. 92-12-043/A. 93-03-038/A. 94-05-035/A. 94-06-034/A. 94-09-056/A. 94-06-044 — February 28, 1996)
 - *Natural gas market dynamics; gas pipeline rate design.*
24. Prepared Direct Testimony on Behalf of the **California Cogeneration Council and Watson Cogeneration Company** (A. 96-03-031 — July 12, 1996)
 - *Natural gas rate design: parity rates for cogenerators.*
25. Prepared Direct Testimony on Behalf of the **City of Vernon** (A. 96-10-038 — August 6, 1997)
 - *Impacts of a major utility merger on competition in natural gas and electric markets.*
26. a. Prepared Direct Testimony on Behalf of the **Electricity Generation Coalition** (A. 97-03-002 — December 18, 1997)
 - b. Prepared Rebuttal Testimony on Behalf of the **Electricity Generation Coalition** (A. 97-03-002 — January 9, 1998)
 - *Natural gas rate design for gas-fired electric generators.*
27. Prepared Direct Testimony on Behalf of the **City of Vernon** (A. 97-03-015 — January 16, 1998)
 - *Natural gas service to Baja, California, Mexico.*

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28.
 - a. Prepared Direct Testimony on Behalf of the **California Cogeneration Council and Watson Cogeneration Company** (A. 98-10-012/A. 98-10-031/A. 98-07-005 — March 4, 1999).
 - b. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (A. 98-10-012/A. 98-01-031/A. 98-07-005 — March 15, 1999).
 - c. Prepared Direct Testimony on Behalf of the **California Cogeneration Council** (A. 98-10-012/A. 98-01-031/A. 98-07-005 — June 25, 1999).
 - *Natural gas cost allocation and rate design for gas-fired electric generators.*
29.
 - a. Prepared Direct Testimony on Behalf of the **California Cogeneration Council and Watson Cogeneration Company** (R. 99-11-022 — February 11, 2000).
 - b. Prepared Rebuttal Testimony on Behalf of the **California Cogeneration Council and Watson Cogeneration Company** (R. 99-11-022 — March 6, 2000).
 - c. Prepared Direct Testimony on Line Loss Issues of behalf of the **California Cogeneration Council** (R. 99-11-022 — April 28, 2000).
 - d. Supplemental Direct Testimony in Response to ALJ Cooke's Request on behalf of the **California Cogeneration Council and Watson Cogeneration Company** (R. 99-11-022 — April 28, 2000).
 - e. Prepared Rebuttal Testimony on Line Loss Issues on behalf of the **California Cogeneration Council** (R. 99-11-022 — May 8, 2000).
 - *Market-based, avoided cost pricing for the electric output of gas-fired cogeneration facilities in the California market; electric line losses.*
30.
 - a. Direct Testimony on behalf of the **Indicated Electric Generators** in Support of the Comprehensive Gas OII Settlement Agreement for Southern California Gas Company and San Diego Gas & Electric Company (I. 99-07-003 — May 5, 2000).
 - b. Rebuttal Testimony in Support of the Comprehensive Settlement Agreement on behalf of the **Indicated Electric Generators** (I. 99-07-003 — May 19, 2000).
 - *Testimony in support of a comprehensive restructuring of natural gas rates and services on the Southern California Gas Company system. Natural gas cost allocation and rate design for gas-fired electric generators.*
31.
 - a. Prepared Direct Testimony on the Cogeneration Gas Allowance on behalf of the **California Cogeneration Council** (A. 00-04-002 — September 1, 2000).
 - b. Prepared Direct Testimony on behalf of **Southern Energy California** (A. 00-04-002 — September 1, 2000).
 - *Natural gas cost allocation and rate design for gas-fired electric generators.*

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32.
 - a. Prepared Direct Testimony on behalf of **Watson Cogeneration Company** (A. 00-06-032 — September 18, 2000).
 - b. Prepared Rebuttal Testimony on behalf of **Watson Cogeneration Company** (A. 00-06-032 — October 6, 2000).
 - *Rate design for a natural gas “peaking service.”*
33.
 - a. Prepared Direct Testimony on behalf of **PG&E National Energy Group & Calpine Corporation** (I. 00-11-002—April 25, 2001).
 - b. Prepared Rebuttal Testimony on behalf of **PG&E National Energy Group & Calpine Corporation** (I. 00-11-002—May 15, 2001).
 - *Terms and conditions of natural gas service to electric generators; gas curtailment policies.*
34.
 - a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 99-11-022—May 7, 2001).
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council** (R. 99-11-022—May 30, 2001).
 - *Avoided cost pricing for alternative energy producers in California.*
35.
 - a. Prepared Direct Testimony of R. Thomas Beach in Support of the Application of **Wild Goose Storage Inc.** (A. 01-06-029—June 18, 2001).
 - b. Prepared Rebuttal Testimony of R. Thomas Beach on behalf of **Wild Goose Storage** (A. 01-06-029—November 2, 2001)
 - *Consumer benefits from expanded natural gas storage capacity in California.*
36. Prepared Direct Testimony on behalf of the **County of San Bernardino** (I. 01-06-047—December 14, 2001)
 - *Reasonableness review of a natural gas utility’s procurement practices and storage operations.*
37.
 - a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024—May 31, 2002)
 - b. Prepared Supplemental Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024—May 31, 2002)
 - *Electric procurement policies for California’s electric utilities in the aftermath of the California energy crisis.*

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38. Prepared Direct Testimony on behalf of the **California Manufacturers & Technology Association** (R. 02-01-011—June 6, 2002)
 - *“Exit fees” for direct access customers in California.*
39. Prepared Direct Testimony on behalf of the **County of San Bernardino** (A. 02-02-012 — August 5, 2002)
 - *General rate case issues for a natural gas utility; reasonableness review of a natural gas utility’s procurement practices.*
40. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology Association** (A. 98-07-003 — February 7, 2003)
 - *Recovery of past utility procurement costs from direct access customers.*
41.
 - a. Prepared Direct Testimony on behalf of the **California Cogeneration Council, the California Manufacturers & Technology Association, Calpine Corporation, and Mirant Americas, Inc.** (A 01-10-011 — February 28, 2003)
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council, the California Manufacturers & Technology Association, Calpine Corporation, and Mirant Americas, Inc.** (A 01-10-011 — March 24, 2003)
 - *Rate design issues for Pacific Gas & Electric’s gas transmission system (Gas Accord II).*
42.
 - a. Prepared Direct Testimony on behalf of the **California Manufacturers & Technology Association; Calpine Corporation; Duke Energy North America; Mirant Americas, Inc.; Watson Cogeneration Company; and West Coast Power, Inc.** (R. 02-06-041 — March 21, 2003)
 - b. Prepared Rebuttal Testimony on behalf of the **California Manufacturers & Technology Association; Calpine Corporation; Duke Energy North America; Mirant Americas, Inc.; Watson Cogeneration Company; and West Coast Power, Inc.** (R. 02-06-041 — April 4, 2003)
 - *Cost allocation of above-market interstate pipeline costs for the California natural gas utilities.*
43. Prepared Direct Testimony of R. Thomas Beach and Nancy Rader on behalf of the **California Wind Energy Association** (R. 01-10-024 — April 1, 2003)
 - *Design and implementation of a Renewable Portfolio Standard in California.*

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44.
 - a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024 — June 23, 2003)
 - b. Prepared Supplemental Testimony on behalf of the **California Cogeneration Council** (R. 01-10-024 — June 29, 2003)
 - *Power procurement policies for electric utilities in California.*
45. Prepared Direct Testimony on behalf of the **Indicated Commercial Parties** (02-05-004 — August 29, 2003)
 - *Electric revenue allocation and rate design for commercial customers in southern California.*
46.
 - a. Prepared Direct Testimony on behalf of **Calpine Corporation and the California Cogeneration Council** (A. 04-03-021 — July 16, 2004)
 - b. Prepared Rebuttal Testimony on behalf of **Calpine Corporation and the California Cogeneration Council** (A. 04-03-021 — July 26, 2004)
 - *Policy and rate design issues for Pacific Gas & Electric's gas transmission system (Gas Accord III).*
47. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (A. 04-04-003 — August 6, 2004)
 - *Policy and contract issues concerning cogeneration QFs in California.*
48.
 - a. Prepared Direct Testimony on behalf of the **California Cogeneration Council and the California Manufacturers and Technology Association** (A. 04-07-044 — January 11, 2005)
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council and the California Manufacturers and Technology Association** (A. 04-07-044 — January 28, 2005)
 - *Natural gas cost allocation and rate design for large transportation customers in northern California.*
49.
 - a. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology Association and the Indicated Commercial Parties** (A. 04-06-024 — March 7, 2005)
 - b. Prepared Rebuttal Testimony on behalf of the **California Manufacturers and Technology Association and the Indicated Commercial Parties** (A. 04-06-024 — April 26, 2005)
 - *Electric marginal costs, revenue allocation, and rate design for commercial and industrial electric customers in northern California.*

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50. Prepared Direct Testimony on behalf of the **California Solar Energy Industries Association** (R. 04-03-017 — April 28, 2005)
 - *Cost-effectiveness of the Million Solar Roofs Program.*
51. Prepared Direct Testimony on behalf of **Watson Cogeneration Company, the Indicated Producers, and the California Manufacturing and Technology Association** (A. 04-12-004 — July 29, 2005)
 - *Natural gas rate design policy; integration of gas utility systems.*
52.
 - a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 04-04-003/R. 04-04-025 — August 31, 2005)
 - b. Prepared Rebuttal Testimony on behalf of the **California Cogeneration Council** (R. 04-04-003/R. 04-04-025 — October 28, 2005)
 - *Avoided cost rates and contracting policies for QFs in California*
53.
 - a. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology Association and the Indicated Commercial Parties** (A. 05-05-023 — January 20, 2006)
 - b. Prepared Rebuttal Testimony on behalf of the **California Manufacturers and Technology Association and the Indicated Commercial Parties** (A. 05-05-023 — February 24, 2006)
 - *Electric marginal costs, revenue allocation, and rate design for commercial and industrial electric customers in southern California.*
54.
 - a. Prepared Direct Testimony on behalf of the **California Producers** (R. 04-08-018 – January 30, 2006)
 - b. Prepared Rebuttal Testimony on behalf of the **California Producers** (R. 04-08-018 – February 21, 2006)
 - *Transportation and balancing issues concerning California gas production.*
55. Prepared Direct Testimony on behalf of the **California Manufacturers and Technology Association and the Indicated Commercial Parties** (A. 06-03-005 — October 27, 2006)
 - *Electric marginal costs, revenue allocation, and rate design for commercial and industrial electric customers in northern California.*
56. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (A. 05-12-030 — March 29, 2006)
 - *Review and approval of a new contract with a gas-fired cogeneration project.*

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57.
 - a. Prepared Direct Testimony on behalf of **Watson Cogeneration, Indicated Producers, the California Cogeneration Council, and the California Manufacturers and Technology Association** (A. 04-12-004 — July 14, 2006)
 - b. Prepared Rebuttal Testimony on behalf of **Watson Cogeneration, Indicated Producers, the California Cogeneration Council, and the California Manufacturers and Technology Association** (A. 04-12-004 — July 31, 2006)
 - *Restructuring of the natural gas system in southern California to include firm capacity rights; unbundling of natural gas services; risk/reward issues for natural gas utilities.*
58. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (R. 06-02-013 — March 2, 2007)
 - *Utility procurement policies concerning gas-fired cogeneration facilities.*
59.
 - a. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 07-01-047 — August 10, 2007)
 - b. Prepared Rebuttal Testimony on behalf of the **Solar Alliance** (A. 07-01-047 — September 24, 2007)
 - *Electric rate design issues that impact customers installing solar photovoltaic systems.*
60.
 - a. Prepared Direct Testimony on Behalf of **Gas Transmission Northwest Corporation** (A. 07-12-021 — May 15, 2008)
 - b. Prepared Rebuttal Testimony on Behalf of **Gas Transmission Northwest Corporation** (A. 07-12-021 — June 13, 2008)
 - *Utility subscription to new natural gas pipeline capacity serving California.*
61.
 - a. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 08-03-015 — September 12, 2008)
 - b. Prepared Rebuttal Testimony on behalf of the **Solar Alliance** (A. 08-03-015 — October 3, 2008)
 - *Issues concerning the design of a utility-sponsored program to install 500 MW of utility- and independently-owned solar photovoltaic systems.*

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62. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 08-03-002 — October 31, 2008)
 - *Electric rate design issues that impact customers installing solar photovoltaic systems.*
63.
 - a. Phase II Direct Testimony on behalf of **Indicated Producers, the California Cogeneration Council, California Manufacturers and Technology Association, and Watson Cogeneration Company** (A. 08-02-001 — December 23, 2008)
 - b. Phase II Rebuttal Testimony on behalf of **Indicated Producers, the California Cogeneration Council, California Manufacturers and Technology Association, and Watson Cogeneration Company** (A. 08-02-001 — January 27, 2009)
 - *Natural gas cost allocation and rate design issues for large customers.*
64.
 - a. Prepared Direct Testimony on behalf of the **California Cogeneration Council** (A. 09-05-026 — November 4, 2009)
 - *Natural gas cost allocation and rate design issues for large customers.*
65.
 - a. Prepared Direct Testimony on behalf of **Indicated Producers and Watson Cogeneration Company** (A. 10-03-028 — October 5, 2010)
 - b. Prepared Rebuttal Testimony on behalf of **Indicated Producers and Watson Cogeneration Company** (A. 10-03-028 — October 26, 2010)
 - *Revisions to a program of firm backbone capacity rights on natural gas pipelines.*
66. Prepared Direct Testimony on behalf of the **Solar Alliance** (A. 10-03-014 — October 6, 2010)
 - *Electric rate design issues that impact customers installing solar photovoltaic systems.*
67. Prepared Rebuttal Testimony on behalf of the **Indicated Settling Parties** (A. 09-09-013 — October 11, 2010)
 - *Testimony on proposed modifications to a broad-based settlement of rate-related issues on the Pacific Gas & Electric natural gas pipeline system.*

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68.
 - a. Supplemental Prepared Direct Testimony on behalf of **Sacramento Natural Gas Storage, LLC** (A. 07-04-013 — December 6, 2010)
 - b. Supplemental Prepared Rebuttal Testimony on behalf of **Sacramento Natural Gas Storage, LLC** (A. 07-04-013 — December 13, 2010)
 - c. Supplemental Prepared Reply Testimony on behalf of **Sacramento Natural Gas Storage, LLC** (A. 07-04-013 — December 20, 2010)
 - *Local reliability benefits of a new natural gas storage facility.*
69. Prepared Direct Testimony on behalf of **The Vote Solar Initiative** (A. 10-11-015—June 1, 2011)
 - *Distributed generation policies; utility distribution planning.*
70. Prepared Reply Testimony on behalf of the **Solar Alliance** (A. 10-03-014—August 5, 2011)
 - *Electric rate design for commercial & industrial solar customers.*
71. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 11-06-007—February 6, 2012)
 - *Electric rate design for solar customers; marginal costs.*
72.
 - a. Prepared Direct Testimony on behalf of the **Northern California Indicated Producers** (R.11-02-019—January 31, 2012)
 - b. Prepared Rebuttal Testimony on behalf of the **Northern California Indicated Producers** (R. 11-02-019—February 28, 2012)
 - *Natural gas pipeline safety policies and costs*
73. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 11-10-002—June 12, 2012)
 - *Electric rate design for solar customers; marginal costs.*
74. Prepared Direct Testimony on behalf of the **Southern California Indicated Producers** and **Watson Cogeneration Company** (A. 11-11-002—June 19, 2012)
 - *Natural gas pipeline safety policies and costs*

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75.
 - a. Testimony on behalf of the **California Cogeneration Council** (R. 12-03-014—June 25, 2012)
 - b. Reply Testimony on behalf of the **California Cogeneration Council** (R. 12-03-014—July 23, 2012)
 - *Ability of combined heat and power resources to serve local reliability needs in southern California.*
76.
 - a. Prepared Testimony on behalf of the **Southern California Indicated Producers and Watson Cogeneration Company** (A. 11-11-002, Phase 2—November 16, 2012)
 - b. Prepared Rebuttal Testimony on behalf of the **Southern California Indicated Producers and Watson Cogeneration Company** (A. 11-11-002, Phase 2—December 14, 2012)
 - *Allocation and recovery of natural gas pipeline safety costs.*
77. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 12-12-002—May 10, 2013)
 - *Electric rate design for commercial & industrial solar customers; marginal costs.*
78. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 13-04-012—December 13, 2013)
 - *Electric rate design for commercial & industrial solar customers; marginal costs.*
79. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 13-12-015—June 30, 2014)
 - *Electric rate design for commercial & industrial solar customers; residential time-of-use rate design issues.*

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80.
 - a. Prepared Direct Testimony on behalf of **Calpine Corporation** and the **Indicated Shippers** (A. 13-12-012—August 11, 2014)
 - b. Prepared Direct Testimony on behalf of **Calpine Corporation, the Canadian Association of Petroleum Producers, Gas Transmission Northwest, and the City of Palo Alto** (A. 13-12-012—August 11, 2014)
 - c. Prepared Rebuttal Testimony on behalf of **Calpine Corporation** (A. 13-12-012—September 15, 2014)
 - d. Prepared Rebuttal Testimony on behalf of **Calpine Corporation, the Canadian Association of Petroleum Producers, Gas Transmission Northwest, and the City of Palo Alto** (A. 13-12-012—September 15, 2014)
 - *Rate design, cost allocation, and revenue requirement issues for the gas transmission system of a major natural gas utility.*
81. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (R. 12-06-013—September 15, 2014)
 - *Comprehensive review of policies for rate design for residential electric customers in California.*
82. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 14-06-014—March 13, 2015)
 - *Electric rate design for commercial & industrial solar customers; marginal costs.*
83.
 - a. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A.14-11-014—May 1, 2015)
 - b. Prepared Rebuttal Testimony on behalf of the **Solar Energy Industries Association** (A. 14-11-014—May 26, 2015)
 - *Time-of-use periods for residential TOU rates.*
84. Prepared Rebuttal Testimony on behalf of the **Joint Solar Parties** (R. 14-07-002 — September 30, 2015)
 - *Electric rate design issues concerning proposals for the net energy metering successor tariff in California.*
85. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 15-04-012—July 5, 2016)
 - *Selection of Time-of-Use periods, and rate design issues for solar customers.*

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86. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 16-09-003 — April 28, 2017)
 - *Selection of Time-of-Use periods, and rate design issues for solar customers.*
87. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 17-06-030 — March 23, 2018)
 - *Selection of Time-of-Use periods, and rate design issues for solar customers.*
88. Prepared Direct and Rebuttal Testimony on behalf of **Calpine Corporation** (A. 17-11-009 – July 20 and August 20, 2018)
 - *Gas transportation rates for electric generators, gas storage and balancing issues*
89. Prepared Direct Testimony on behalf of **Gas Transmission Northwest LLC** and the **City of Palo Alto** (A. 17-11-009 – July 20, 2018)
 - *Rate design for intrastate backbone gas transportation rates*
90. Prepared Direct Testimony on behalf of **EVgo** (A. 18-11-003 – April 5, 2019)
 - *Electric rate design for commercial electric vehicle charging*
91. Prepared Direct and Rebuttal Testimony on behalf of **Vote Solar** and the **Solar Energy Industries Association** (R. 14-10-003 — October 7 and 21, 2019)
 - *Avoided cost issues for distributed energy resources*
92. Prepared Direct and Rebuttal Testimony on behalf of **EVgo** (A. 19-07-006 – January 13 and February 20, 2020)
 - *Electric rate design for commercial electric vehicle charging*
93. Prepared Direct Testimony on behalf of the **Solar Energy Industries Association** (A. 19-03-002 — March 17, 2020)
 - *Electric rate design issues for solar and storage customers*

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EXPERT WITNESS TESTIMONY BEFORE THE ARIZONA CORPORATION COMMISSION

1. Prepared Direct, Rebuttal, and Supplemental Testimony on behalf of **The Alliance for Solar Choice (TASC)**, (Docket No. E-00000J-14-0023, February 27, April 7, and June 22, 2016).
 - *Development of a benefit-cost methodology for distributed, net metered solar resources in Arizona.*
2. Prepared Surrebuttal and Responsive Testimony on behalf of the **Energy Freedom Coalition of America** (Docket No. E-01933A-15-0239 – March 10 and September 15, 2016).
 - *Critique of a utility-owned solar program; comments on a fixed rate credit to replace net energy metering.*
3. Direct Testimony on behalf of the **Solar Energy Industries Association** (Docket No. E-01345A-16-0036, February 3, 2017).
4. Direct and Surrebuttal Testimony on behalf of **The Alliance for Solar Choice and the Energy Freedom Coalition of America** (Docket Nos. E-01933A-15-0239 (TEP), E-01933A-15-0322 (TEP), and E-04204A-15-0142 (UNSE) – May 17 and September 29, 2017).

EXPERT WITNESS TESTIMONY BEFORE THE COLORADO PUBLIC UTILITIES COMMISSION

1. Direct Testimony and Exhibits on behalf of the **Colorado Solar Energy Industries Association** and the **Solar Alliance**, (Docket No. 09AL-299E – October 2, 2009).
https://www.dora.state.co.us/pls/efi/DDMS_Public.Display_Document?p_section=PUC&p_source=EFI_PRIVATE&p_doc_id=3470190&p_doc_key=0CD8F7FCDB673F1043928849D9D8CAB1&p_handle_not_found=Y
 - *Electric rate design policies to encourage the use of distributed solar generation.*
2. Direct Testimony and Exhibits on behalf of the **Vote Solar Initiative** and the **Interstate Renewable Energy Council**, (Docket No. 11A-418E – September 21, 2011).
 - *Development of a community solar program for Xcel Energy.*
3. Answer Testimony and Exhibits, plus Opening Testimony on Settlement, on behalf of the **Solar Energy Industries Association**, (Docket No. 16AL-0048E [Phase II] – June 6 and September 2, 2016).
 - *Rate design issues related to residential customers and solar distributed generation in a Public Service of Colorado general rate case.*

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EXPERT WITNESS TESTIMONY BEFORE THE GEORGIA PUBLIC SERVICE COMMISSION

1. Direct Testimony on behalf of **Georgia Interfaith Power & Light and Southface Energy Institute, Inc.** (Docket No. 40161 – May 3, 2016).
 - *Development of a cost-effectiveness methodology for solar resources in Georgia.*

EXPERT WITNESS TESTIMONY BEFORE THE IDAHO PUBLIC UTILITIES COMMISSION

1. Direct Testimony on behalf of the **Idaho Conservation League** (Case No. IPC-E-12-27—May 10, 2013)
 - *Costs and benefits of net energy metering in Idaho.*
2.
 - a. Direct Testimony on behalf of the **Idaho Conservation League and the Sierra Club** (Case Nos. IPC-E-15-01/AVU-4-15-01/PAC-E-15-03 — April 23, 2015)
 - b. Rebuttal Testimony on behalf of the **Idaho Conservation League and the Sierra Club** (Case Nos. IPC-E-15-01/AVU-4-15-01/PAC-E-15-03 — May 14, 2015)
 - *Issues concerning the term of PURPA contracts in Idaho.*
2.
 - a. Direct Testimony on behalf of the **Sierra Club** (Case No. IPC-E-17-13 — December 22, 2017)
 - b. Rebuttal Testimony on behalf of the **Sierra Club** (Case No. IPC-E-17-13 — January 26, 2018)

EXPERT WITNESS TESTIMONY BEFORE THE MASSACHUSETTS DEPARTMENT OF PUBLIC UTILITIES

1. Direct and Rebuttal Testimony on behalf of **Northeast Clean Energy Council, Inc.** (Docket D.P.U. 15-155, March 18 and April 28, 2016)
 - *Residential rate design and access fee proposals related to distributed generation in a National Grid general rate case.*

EXPERT WITNESS TESTIMONY BEFORE THE MICHIGAN PUBLIC SERVICE COMMISSION

1. Prepared Direct Testimony on behalf of **Vote Solar** (Case No. U-18419—January 12, 2018)
2. Prepared Rebuttal Testimony on behalf of the **Environmental Law and Policy Center, the Ecology Center, the Solar energy Industries Association, Vote Solar, and the Union of Concerned Scientists** (Case No. U-18419 — February 2, 2018)

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EXPERT WITNESS TESTIMONY BEFORE THE MINNESOTA PUBLIC UTILITIES COMMISSION

1. Direct and Rebuttal Testimony on Behalf of **Geronimo Energy, LLC**. (In the Matter of the Petition of Northern States Power Company to Initiate a Competitive Resource Acquisition Process [OAH Docket No. 8-2500-30760, MPUC Docket No. E002/CN-12-1240, September 27 and October 18, 2013])
 - *Testimony in support of a competitive bid from a distributed solar project in an all-source solicitation for generating capacity.*

EXPERT WITNESS TESTIMONY BEFORE THE MONTANA PUBLIC SERVICE COMMISSION

1. Pre-filed Direct and Supplemental Testimony on Behalf of **Vote Solar and the Montana Environmental Information Center** (Docket No. D2016.5.39, October 14 and November 9, 2016).
 - *Avoided cost pricing issues for solar QFs in Montana.*

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC UTILITIES COMMISSION OF NEVADA

1. Pre-filed Direct Testimony on Behalf of the **Nevada Geothermal Industry Council** (Docket No. 97-2001—May 28, 1997)
 - *Avoided cost pricing for the electric output of geothermal generation facilities in Nevada.*
2. Pre-filed Direct Testimony on Behalf of **Nevada Sun-Peak Limited Partnership** (Docket No. 97-6008—September 5, 1997)
 - *QF pricing issues in Nevada.*
3. Pre-filed Direct Testimony on Behalf of the **Nevada Geothermal Industry Council** (Docket No. 98-2002 — June 18, 1998)
 - *Market-based, avoided cost pricing for the electric output of geothermal generation facilities in Nevada.*
4.
 - a. Prepared Direct Testimony on behalf of **The Alliance for Solar Choice (TASC)**, (Docket Nos. 15-07041 and 15-07042 –October 27, 2015).
 - b. Prepared Direct Testimony on Grandfathering Issues on behalf of **TASC**, (Docket Nos. 15-07041 and 15-07042 –February 1, 2016).

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- c. Prepared Rebuttal Testimony on Grandfathering Issues on behalf of **TASC**, (Docket Nos. 15-07041 and 15-07042 –February 5, 2016).
- *Net energy metering and rate design issues in Nevada.*

EXPERT WITNESS TESTIMONY BEFORE THE NEW HAMPSHIRE PUBLIC UTILITIES COMMISSION

- 1. Prepared Direct and Rebuttal Testimony on behalf of **The Alliance for Solar Choice (TASC)**, (Docket No. DE 16-576, October 24 and December 21, 2016).
- *Net energy metering and rate design issues in New Hampshire.*

EXPERT WITNESS TESTIMONY BEFORE THE NEW MEXICO PUBLIC REGULATION COMMISSION

- 1. Direct Testimony on Behalf of the **Interstate Renewable Energy Council** (Case No. 10-00086-UT—February 28, 2011)
<http://164.64.85.108/infodocs/2011/3/PRS20156810DOC.PDF>
 - *Testimony on proposed standby rates for new distributed generation projects; cost-effectiveness of DG in New Mexico.*
- 2. Direct Testimony and Exhibits on behalf of the **New Mexico Independent Power Producers** (Case No. 11-00265-UT, October 3, 2011)
 - *Cost cap for the Renewable Portfolio Standard program in New Mexico*

EXPERT WITNESS TESTIMONY BEFORE THE NORTH CAROLINA UTILITIES COMMISSION

- 1. Direct, Response, and Rebuttal Testimony on Behalf of the North Carolina Sustainable Energy Association. (In the Matter of Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities – 2014; Docket E-100 Sub 140; April 25, May 30, and June 20, 2014)
 - *Testimony on avoided cost issues related to solar and renewable qualifying facilities in North Carolina.*

April 25, 2014: <http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=89f3b50f-17cb-4218-87bd-c743e1238bc1>

May 30, 2014: <http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=19e0b58d-a7f6-4d0d-9f4a-08260e561443>

June 20, 2014: <http://starw1.ncuc.net/NCUC/ViewFile.aspx?Id=bd549755-d1b8-4c9b-b4a1-fc6e0bd2f9a2>

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2. Direct Testimony on Behalf of the North Carolina Sustainable Energy Association. (In the Matter of Biennial Determination of Avoided Cost Rates for Electric Utility Purchases from Qualifying Facilities – 2018; Docket E-100 Sub 158; June 21, 2019)
 - *Testimony on avoided cost issues related to solar and renewable qualifying facilities in North Carolina.*

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC UTILITIES COMMISSION OF OREGON

1.
 - a. Direct Testimony of Behalf of **Weyerhaeuser Company** (UM 1129 — August 3, 2004)
 - b. Surrebuttal Testimony of Behalf of **Weyerhaeuser Company** (UM 1129 — October 14, 2004)
2.
 - a. Direct Testimony of Behalf of **Weyerhaeuser Company and the Industrial Customers of Northwest Utilities** (UM 1129 / Phase II — February 27, 2006)
 - b. Rebuttal Testimony of Behalf of **Weyerhaeuser Company and the Industrial Customers of Northwest Utilities** (UM 1129 / Phase II — April 7, 2006)
 - *Policies to promote the development of cogeneration and other qualifying facilities in Oregon.*
3. Direct Testimony on Behalf of the **Oregon Solar Energy Industries Association** (UM 1910,01911, and 1912 — March 16, 2018).
 - *Resource value of solar resources in Oregon*

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC SERVICE COMMISSION OF SOUTH CAROLINA

1. Direct Testimony and Exhibits on behalf of **The Alliance for Solar Choice** (Docket No. 2014-246-E – December 11, 2014)
<https://dms.psc.sc.gov/attachments/matter/B7BACF7A-155D-141F-236BC437749BEF85>
 - *Methodology for evaluating the cost-effectiveness of net energy metering*

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EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC UTILITIES COMMISSION OF TEXAS

1. Direct Testimony on behalf of the **Solar Energy Industries Association (SEIA)** (Docket No. 44941 – December 11, 2015)
 - *Rate design issues concerning net metering and renewable distributed generation in an El Paso Electric general rate case.*

EXPERT WITNESS TESTIMONY BEFORE THE PUBLIC SERVICE COMMISSION OF UTAH

1. Direct Testimony on behalf of the **Sierra Club** (Docket No. 15-035-53—September 15, 2015)
 - *Issues concerning the term of PURPA contracts in Idaho.*

EXPERT WITNESS TESTIMONY BEFORE THE VERMONT PUBLIC SERVICE BOARD

1. Pre-filed Testimony of R. Thomas Beach and Patrick McGuire on Behalf of **Allco Renewable Energy Limited** (Docket No. 8010 — September 26, 2014)
 - *Avoided cost pricing issues in Vermont*

EXPERT WITNESS TESTIMONY BEFORE THE VIRGINIA CORPORATION COMMISSION

Direct Testimony and Exhibits on Behalf of the Maryland – District of Columbia – Virginia Solar Energy Industries Association, (Case No. PUE-2011-00088, October 11, 2011)
<http://www.scc.virginia.gov/docketsearch/DOCS/2gx%2501!.PDF>

- *Cost-effectiveness of, and standby rates for, net-metered solar customers.*

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LITIGATION EXPERIENCE

Mr. Beach has been retained as an expert in a variety of civil litigation matters. His work has included the preparation of reports on the following topics:

- The calculation of damages in disputes over the pricing terms of natural gas sales contracts (2 separate cases).
- The valuation of a contract for the purchase of power produced from wind generators.
- The compliance of cogeneration facilities with the policies and regulations applicable to Qualifying Facilities (QFs) under PURPA in California.
- Audit reports on the obligations of buyers and sellers under direct access electric contracts in the California market (2 separate cases).
- The valuation of interstate pipeline capacity contracts (3 separate cases).

In several of these matters, Mr. Beach was deposed by opposing counsel. Mr. Beach has also testified at trial in the bankruptcy of a major U.S. energy company, and has been retained as a consultant in anti-trust litigation concerning the California natural gas market in the period prior to and during the 2000-2001 California energy crisis.